CHEMISTRY QUESTION PAPER

Time : 2 Hrs.
Max. Marks : 40

Note :
(i) All questions carry equal marks.
(ii) Give balanced equations and draw diagrams wherever necessary.
(iii) Use of logarithmic table is allowed.
(iv) Figures to the right indicate full marks.
(v) Answer to every question must be written on a new page.

Q. 1 Select and write the most appropriate answer from the given alternatives for each sub-
question. [8]

(i) Which of the following ions is colourless? (1)
   (a) Zn^{2+}    (b) Ni^{3+}    (c) Co^{2+}    (d) Fe^{2+}

(ii) Among the following equimolar solutions identify the one having highest boiling point. (1)
   (a) Urea    (b) Sucrose    (c) Sodium chloride    (d) Sodium sulphate

(iii) The order of reaction between equimolar mixture of H_2 and Cl_2 in the presence of sunlight is ...........
   (a) 0    (b) 1    (c) 2    (d) 3.

(iv) The enthalpy of which of the following substances in standard state is zero? (1)
   (a) Carbon    (b) Calcium carbonate    (c) Ammonia    (d) Nitric acid.

(v) The basic principle used in Hydrogen bomb is ...........
   (a) Nuclear fission    (b) Nuclear fission
   (c) Nuclear disintegration    (d) Artificial radioactivity.

(vi) Ostwald’s Dilution Law is applicable in case of dilute solution of ...........
   (a) HCl    (b) H_2SO_4    (c) NaOH    (d) CH_3COOH

(vii) When a change of 1 Faraday is passed through AlCl_3 solution, the amount of Aluminium deposited at cathode in gram is ........... (At. Wt. of Al = 27) (1)
   (a) 9    (b) 18    (c) 27    (d) 2.7

(viii) The heat of Neutralization of HCl by NaOH solution is - 57 kJ. The heat liberated in neutralization of 109.5 x 10^{-3} kg of HCl is ...........
   (a) 57 KJ    (b) 114 KJ    (c) 171 KJ    (d) 117 KJ.

Q. 2 (A) Attempt any one : [8]
   (i) State and explain the van’t Hoff-Boyle’s Law. (2)
   (ii) Give one statement of First Law of Thermodynamics and give its corollary. (2)

(B) Attempt any one :
   (i) Derive Ostwald’s Dilution Law for weak acid. (2)
   (ii) State and explain Faraday’s Second Law of Electrolysis. (2)

(C) Answer the following :
   (i) Distinguish between Molecularity of reaction and Order of reaction. (2)
   (ii) Give names and formulae of any two ores of Zinc. (2)

Q. 3 (A) Attempt any one : [8]
   (i) Define Hydrolysis of salt and show that degree of hydrolysis of salt of weak acid and weak base is independent of concentration of solution. (3)
   (ii) What is Artificial Transmutation ? Write nuclear reactions for artificial transmutation using alpha particle and neutron as projectiles. (3)

(B) Attempt any one :
   (i) What is Rate Law ? Show that, half life of first order chemical reaction is independent of initial concentration of the reactant. (3)
   (ii) Give the observed outer electronic configuration of Copper (Z = 29).
        Why are compounds of Copper ‘coloured’ while those of Zinc ‘colourless’ ? (3)

(C) Answer the following :
   Define : (1) Mole fraction, (2) Faraday. (2)

Q. 4 (A) Answer the following : [8]
   State and explain Hess’s Law of Constant Heat Summation and give its ‘four’
(B) Attempt any one:

(i) Describe the construction and working of Standard Hydrogen electrode.
   Give its 'two' disadvantages. (4)

(ii) Describe Landsberger - Walker method for the determination of molecular weight of solute by boiling point elevation. (4)

Q. 5 (A) Attempt any one:

(i) Heat of following reaction at constant volume (ΔE) at 300 K is

\[
\text{H}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O} (\text{l}) \quad [\Delta E = -285.8 \text{ kJ/mol}] 
\]

Calculate the heat of formation of water at 500 K.

The mean molar heat capacities at constant pressure in the given range of temperature are \(\text{H}_2(\text{g}) = 28.87\), \(\text{O}_2(\text{g}) = 27\) and \(\text{H}_2\text{O} (\text{l}) = 75.3\) J/K/mol. [\(R = 8.314\) J/K/mol] (4)

(ii) The \(\text{NH}_4\text{OH}\) is 4.3% ionized at 298 K in 0.01M solution.

Calculate the ionization constant and pH of \(\text{NH}_4\text{OH}\). (4)

(B) Attempt any two:

(i) A solution is prepared by adding 3.7 moles of NaCl to 9.8 moles of water.

What is the mole fraction of NaCl and \(\text{H}_2\text{O}\) in the solution? (2)

(ii) A current of 5 amperes was passed through a solution of silver nitrate for 5 minutes when \(1.677 \times 10^{-3}\) kg of silver was deposited at cathode.

Calculate electrochemical equivalent of silver. (2)

(iii) Calculate the time taken by radio element to reduce 25% of its initial activity, if disintegration constant of radio element is \(6.93 \times 10^{-2}\) day\(^{-1}\). (2)